MODIS On-orbit Calibration and Lessons Learned

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The Moderate Resolution Imaging Spectroradiometer (MODIS) is a key instrument for NASA's Earth Observing System (EOS) Terra and Aqua missions. Since launch, Terra and Aqua MODIS have successfully operated for more than 12 and 10 years, respectively, and generated an unprecedented amount of data products for the science and user community over a wide range of applications. MODIS was developed with improved design and stringent calibration requirements over its heritage sensors in order to extend and enhance their long-term data records. Its follow-on instrument, the Visible/Infrared Imager Radiometer Suite (VIIRS), was launched on-board the Suomi National Polar-orbiting Partnership (NPP) spacecraft October 28, 2011. MODIS collects data in 36 spectral bands, covering wavelengths from 0.41 to 14.5μm, and at 250m, 500m, and 1km spatial resolutions (nadir). MODIS on-orbit calibration is provided by a set of onboard calibrators (OBC), including a solar diffuser (SD), a solar diffuser stability monitor (SDSM), a blackbody (BB), and a spectroradiometric calibration assembly (SRCA). In addition to the onboard calibrators, regular lunar observations are made by both Terra and Aqua MODIS to track their calibration stability in the reflective solar region. This tutorial session provides an overview of MODIS on-orbit calibration and characterization methodologies. It discusses challenging issues and lessons learned from sensor design, operation, calibration, and inter-comparisons. Examples of instrument on-orbit performance are illustrated with a focus on the improvements made based on various lessons learned. It is expected that MODIS experience and lessons will continue to provide valuable information for future earth observing missions/sensors.